

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

051009/0122

U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.55)
Unassigned **09/355637**INTERNATIONAL APPLICATION NO.
PCT/EP97/07212INTERNATIONAL FILING DATE
December 19, 1997PRIORITY DATE CLAIMED
February 7, 1997

TITLE OF INVENTION

EDIBLE SHAPED BODIES, IN PARTICULAR FLAT AND TUBULAR FILMS

518 Rec'd PCT/PTO 02 AUG 1999

APPLICANT(S) FOR DO/EO/US

Klaus-Dieter HAMMER; Gerhard GROLIG; Michael AHLERS; and Ulrich DELIUS

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☒ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☒ A translation of the International Application into English (35 U.S.C. 371 (c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☒ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.
☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information:

International Search Report; Translation of Amended Sheets

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17. ☒ The following fees are submitted:**Basic National Fee (37 CFR 1.492(a)(1)-(5)):**

Search Report has been prepared by the EPO or JPO \$840.00

International preliminary examination fee paid to USPTO (37 CFR 1.482)
..... \$670.00No international preliminary examination fee paid to USPTO (37 CFR 1.482)
but international search fee paid to USPTO (37 CFR 1.445(a)(2)) \$760.00Neither international preliminary examination fee (37 CFR 1.482) nor
international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$970.00International preliminary examination fee paid to USPTO (37 CFR 1.482)
and all claims satisfied provisions of PCT Article 33(2)-(4) \$96.00**ENTER APPROPRIATE BASIC FEE AMOUNT =**

CALCULATIONS

PTO USE ONLY

\$840.00

\$ 840.00

Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30
months from the earliest claimed priority date (37 CFR 1.492(e))

\$ 0.00

Claims	Number Filed	Number Extra	Rate
Total Claims	17 -20 =	0	X \$18.00
Independent Claims	1 -3 =	0	X \$78.00
Multiple dependent claim(s) (if applicable)			+ \$260.00

\$ 0.00

TOTAL OF ABOVE CALCULATIONS =

\$ 840.00

Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity statement
must also be filed. (Note 37 CFR 1.9, 1.27, 1.28).

\$ 0.00

SUBTOTAL =

\$ 840.00

Processing fee of \$130.00 for furnishing English translation later the ☐ 20 ☐ 30
months from the earliest claimed priority date (37 CFR 1.492(f)).

\$ 0.00

TOTAL NATIONAL FEE =

\$ 840.00

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be
accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +

\$ 40.00

TOTAL FEES ENCLOSED =

\$ 880.00

Amount to be:
refunded \$
charged \$

a. ☒ A check in the amount of \$880.00 to cover the above fees is enclosed.b. ☐ Please charge my Deposit Account No. 19-0741 in the amount of \$ to the above fees. A duplicate copy of this sheet is enclosed.c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 19-0741. A duplicate copy of this sheet is enclosed.**NOTE:**

Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

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25,479
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE.

Attorney Docket No. 051009/0122

In re patent application of

Klaus-Dieter HAMMER et al.

Serial No.: Unassigned

Filed: August 2, 1999

For: EDIBLE SHAPED BODIES, IN PARTICULAR FLAT AND
TUBULAR FILMS

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to examination of the above-identified application, Applicants respectfully request that the following amendments be entered into the application:

IN THE CLAIMS:

Claim 3, line 1, delete "or 2".

Claim 4, lines 1-2, delete "one or more of claims 1 to 3" and insert "--claim 1--".

Claim 5, lines 1-2, delete "one or more of claims 1 to 4" and insert "--claim 1--".

Claim 6, lines 1-2, delete "one or more of claims 1 to 5" and insert "--claim 1--".

Claim 7, lines 1-2, delete "one or more of claims 1 to 6" and insert "--claim 1--".

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Claim 8, lines 1-2, delete "one or more of claims 1 to 7" and insert --claim 1--.

Claim 9, lines 1-2, delete "one or more of claims 1 to 8" and insert --claim 1--.

Claim 10, lines 1-2, delete "one or more of claims 1 to 9" and insert --claim 1--.

Claim 12, line 1, delete "or 11"

Claim 13, lines 1-2, delete "one or more of claims 1 to 12" and insert --claim 1--.

Claim 14, lines 1-2, delete "one or more of claims 1 to 13" and insert --claim 1--.

Claim 15, lines 1-2, delete "one or more of claims 10 to 12" and insert --claim 1--.

Claim 16, lines 1-2, delete "one or more of claims 1 to 15" and insert --claim 1--.

Claim 17, lines 1-2, delete "one or more of claims 1 to 16" and insert --claim 1--.


Attorney Docket No.: 051009/0122
Applicant: Klaus-Dieter HAMMER et al.

REMARKS

Applicants respectfully request that the foregoing amendments to Claims 3-10 and 12-17 be entered in order to avoid this application incurring a surcharge for the presence of one or more multiple dependent claims.

Respectfully submitted,

August 2, 1999


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Internationales Büro



INTERNATIONALE ANMELDUNG VERÖFFENTLICHT NACH DEM VERTRAG ÜBER DIE
INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS (PCT)

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		(43) Internationales Veröffentlichungsdatum:	13. August 1998 (13.08.98)
(21) Internationales Aktenzeichen: PCT/EP97/07212		(81) Bestimmungsstaaten: AL, AM, AU, AZ, BA, BB, BG, BR, BY, CA, CN, CU, CZ, EF, GE, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, RO, RU, SD, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO Patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), eurasisches Patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), europäisches Patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI Patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).	
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(30) Prioritätsdaten: 197 04 737.8 7. Februar 1997 (07.02.97) DE			
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(54) Title: <u>EDIBLE MOLDED BODIES, ESPECIALLY FLAT AND FLEXIBLE TUBULAR FILMS</u>			
(54) Bezeichnung: ESSBARE FORMKÖRPER, INSBESONDERE FLACH- UND SCHLAUCHFOLIEN			
(57) Abstract			
<p>The invention relates to edible molded bodies in the form of a flat or tubular film based on plastifiable biopolymers, the cleavage products or derivatives thereof and/or synthetic polymers from natural monomers, characterized in that they are produced according to a method comprising the following steps: a) the biopolymers, cleavage products or derivatives thereof and/or synthetic polymers are mixed with at least one edible plasticizer, at least one lubricating agent and at least one cross-linking agent, b) the mixture thus obtained is melted into a thermoplastic material, c) said material is extruded and d) the product obtained by extrusion is calendered and/or stretched or blown and deformed into the edible molded body. The molded bodies cited in the invention are suitable for use as food wrappers for sausages and boiled ham, and are particularly suitable for use as seamless sausage casings.</p>			
(57) Zusammenfassung			
<p>Die Erfindung betrifft eßbare Formkörper in Gestalt einer Flach- oder Schlauchfolie auf der Basis von plastifizierbaren Biopolymeren, seinen Spaltprodukten oder Derivaten und/oder synthetischen Polymeren aus natürlichen Monomeren, die dadurch gekennzeichnet sind, daß man sie nach einem Verfahren mit den folgenden Stufen herstellt: a) Vermischen der Biopolymere, seiner Spaltprodukte oder Derivate und/oder der synthetischen Polymere mit mindestens einem eßbaren Weichmacher, mindestens einem Gleitmittel und mindestens einem Vernetzungsmittel, b) Aufschmelzen des so erhaltenen Gemisches zu einer thermoplastischen Masse, c) Extrudieren dieser Masse und d) Kalandrieren und/oder Verstrecken oder Blasverformen des bei der Extrusion erhaltenen Produkts zu dem eßbaren Formkörper. Die erfindungsgemäßen Formkörper eignen sich zum Verpacken von Nahrungsmitteln, wie Wurst und Kochschinken. Insbesondere eignen sie sich als nahtlose Wursthüllen.</p>			

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Edible shaped bodies, in particular flat and tubular films

5 The invention relates to edible shaped bodies based on plastifiable biopolymers, cleavage products or derivatives thereof and/or synthetic polymers made from natural monomers. They are mainly used as packaging films and sausage casings.

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As edible sausage casings, there have proved useful, in addition to natural casings (for bockwurst especially sheep gut), only collagen films and tubes (DE-B 17 92 627 and US-A 3 535 125). Edible casings based on calcium
15 alginate (DE-B 12 13 211) have not been able to establish themselves.

Edible collagen films and tubes are produced from cattle hides by a very complex and environmentally-polluting
20 process. The hides are digested with acids (e.g. lactic acid) until the fibrils are obtained; the high-viscosity mass is extruded and precipitated and consolidated slowly and compactly using gaseous NH_3 or with NH_4OH . During drying, crosslinking (curing) then takes place, which
25 strengthens the products to the extent that they withstand the scalding process without any significant loss of mechanical stability.

In contrast, it has not been possible to give the
30 alginate-based sausage casings the necessary stability. In the case of these casings, owing to the action of the sausage emulsion and the brine, the poorly soluble calcium salt is gradually converted into the readily soluble sodium salt of alginic acid. The casings as a
35 result lose their strength.

It was the object of the invention to provide edible shaped bodies, in particular flat and tubular films, which no longer have the abovedescribed disadvantages. In

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addition, they are to be able to be produced from natural raw materials in a simple, inexpensive and environmentally friendly manner. For the use as sausage casings, in addition, the tubular films are to have the required functional properties. In addition to the mechanical, swelling and shrinkage properties, these include especially sufficient heat stability, scalding stability and hydrolysis stability. This means they must also be sufficiently resistant to the hot water or superheated steam used for the scalding.

The object is achieved by providing an edible shaped body in the form of a flat or tubular film based on plasticizable biopolymers or cleavage products or derivatives thereof and/or synthetic polymers of natural monomers which is produced by a process having the following stages:

- a) mixing the biopolymers, cleavage products or derivatives thereof and/or the synthetic polymers with at least one edible plasticizer, at least one lubricant and at least one crosslinker,
- b) melting the resultant mixture to give a thermoplastic mass,
- c) extruding this mass and
- d) calendering and/or stretching or blowing the product obtained from the extrusion to give the edible shaped body.

In a preferred embodiment, the biopolymers, the cleavage products thereof and/or the synthetic polymers are first mixed with the plasticizer and the lubricant and processed to form a thermoplastic mass. Not until then is this mass admixed with the crosslinker and extruded.

The edible shaped body can also have a different shape than that of a flat or tubular film. Instead of stage d), or in addition to this stage, if appropriate, other shaping processes then occur, such as injection molding

or thermoforming. An example of a shaped body produced in this manner is edible table utensils.

The process stages c) and d) need not follow one another directly. It is also possible to store the extruded mass in the interim, e.g. in the form of granules. If it is desirable or required for the respective application, the flat films or tubes of the invention can in addition be partly or completely heat-set.

10

Depending on the shape of the die (annular or slit-shaped), sheets or tubes form during the extrusion from the thermoplastic mixture, and can then be converted, by calendering and/or stretching in the longitudinal and/or transverse direction, or by blowing, into flat films or seamless tubular films. If required, the material is heated during the blowing, calendering or stretching (again). The edible flat or tubular films of the invention generally have a thickness or wall thickness of from 20 to 120 μm , preferably from 30 to 60 μm . In the case of the tubular films, the wall thickness generally increases with increasing internal diameter. By means of the stretching or blowing, the shaped body gains further mechanical strength.

25

The shaped body of the invention has the particular advantage that it may be produced in a particularly environmentally friendly manner without special precipitation and wash baths or any other sorts of baths. In the production process, the generally customary apparatuses for mixing and extrusion, in particular kneaders and single- or twin-screw extruders, can be used.

Preferred examples of the plastifiable biopolymers, of
35 their likewise plastifiable cleavage products or
derivatives and of plastifiable synthetic polymers are
thermoplastic starch, starch derivatives (in particular
starch esters, especially starch acetates and starch
propionates; and in addition also starch ethers,

especially starch alkyl ethers), extrudable gelatins and other natural proteins, such as maize protein, wheat protein and rapeseed protein, casein and its derivatives, chitin and chitosans, alginic acids and alginates, carrageenan (a galactose polysaccharide produced from seaweed), dextran, galactomannans (from carob bean meal, guar gum), pectins (polygalacturonic acids and methyl esters thereof) and polylactic acid (= polylactides). For the shaped bodies of the invention, there is thus a broad selection of starting materials of vegetable and animal origin available. Collagen is unsuitable. It is not available in consistent quality. The content of the biopolymers or cleavage products or derivatives thereof and/or of the synthetic polymers is generally from 10 to 90% by weight, preferably from 15 to 80% by weight, in each case based on the total weight of the shaped body.

Preferably, two or more of the starting materials are used together. They are expediently uniformly mixed and plastified at relatively high temperatures by relatively long kneading in a twin-screw extruder in the presence of a plasticizer, a plasticizing aid (= lubricant), a hardener (= crosslinker) and, if appropriate, a filler.

Suitable plasticizers are glycerol, diglycerol, sorbitol, sorbitol esters, triglycol, carboxymethylcellulose and other compounds which are suitable for food contact and are preferably already officially approved. The content of the plasticizer is generally from 0.5 to 50% by weight, preferably from 2 to 25% by weight, in each case based on the total weight of the shaped body.

Suitable plasticizing aids or lubricants are, especially, vegetable oils, in particular sunflower seed oil, rapeseed oil, olive oil and poppyseed oil. In addition, compounds suitable for use in foods, such as lecithins, triethyl acetylcitrate, sucrose esters, lactones (such as 12-hydroxystearic lactone), lactams and synthetic triglycerides. The content of lubricant(s) is generally from

2 to 30% by weight, preferably from 5 to 20% by weight, in each case based on the total weight of the shaped body.

- 5 Hardeners or crosslinkers which can be used are caramel (caramelized sugar, maillose), woodsmoke condensate, sugar aldehydes, dialdehydes (especially glyoxal and glutardialdehyde), dicarboxylic acids (particularly ali-
10 phatic dicarboxylic acids, such as oxalic acid, malonic acid, adipic acid and succinic acid), dicarboxylic anhydrides (partiucularly adipic-acetic anhydride = diacetyl adipate), di- or triisocyanates (especially hexamethylene diisocyanate) and di- or triepoxides, poly-
15 saccharide aldehydes (particularly dialdehyde starch, dialdehyde alginic acid, dialdehyde pectic acid, dialdehyde gum tragacanth and dialdehyde gum arabic). Generally, suitable crosslinkers are those compounds which contain at least two reactive groups. The content of crosslinker(s) is generally from 0.2 to 30% by weight,
20 preferably from 0.5 to 25% by weight, particularly preferably from 1 to 10% by weight, in each case based on the total weight of the shaped body.

- For edible films, which are, for example, to be used for
25 wrapping cooked ham, and are thus not exposed to high mechanical loading, crosslinkers of relatively weak action are sufficient, such as dicarboxylic acids, sugar aldehydes (mono- and disaccharides) or caramel. Sausage casings which are exposed to a higher mechanical load,
30 especially during stuffing, and must also withstand the scalding process undamaged, in contrast, should be considerably more intensively crosslinked, which can be achieved particularly well by the use of a plurality of crosslinkers. For these, in addition, use may be made of
35 dialdehydes, such as glyoxal or glutardialdehyde, di- or triisocyanates or di- or triepoxides.

To strengthen the shaped bodies of the invention, the mixture, if appropriate, can further comprise fibers,

preferably woodpulp fibers or cotton linters, and/or pigments, in particular inorganic pigments such as calcium carbonate.

- 5 Woodpulp fibers having a length of from 0.2 to 5 mm, preferably from 0.5 to 2 mm, are particularly suitable. The fiber content is expediently from 2 to 30% by weight, preferably from 5 to 20% by weight, in each case based on the total weight of the shaped body.

10

Although the short pulp fibers which act to strengthen are not digestible, as dietary fiber they do promote digestion. They are preferably disposed in a compact middle layer by using special dies, i.e. a layer of a
15 fibrous polymer pulp is extruded into two fiber-free layers. It is also certainly possible to distribute the fibers over the entire cross-sectional area, i.e. to extrude only one fibrous polymer mixture. It is frequently advantageous to incorporate, in addition to the
20 fibers, fillers, such as leather shavings.

- As polymeric starting material, particular preference is given to mixtures of thermoplastic starch with an extrudable protein, particularly preferably gelatin. The
25 ratio of starch to protein in this case is generally from 95:5 to 5:95. To improve stability to moisture and heat, in addition, chitosan or pectin can be added in an amount of from 3 to 30% by weight, preferably from 5 to 20% by weight, in each case based on the total weight of the
30 polymer mixture. Mechanical stability can be increased still further if the thermoplastic starch is completely or partially replaced by starch acetate. By mixing in from 5 to 25% by weight, preferably from 8 to 22% by weight, of glycerol (in each case based on the total
35 weight) and from 2 to 20% by weight, preferably from 5 to 15% by weight, of a natural oil, e.g. sunflower seed oil, the mixture is made soft and flowable, to simplify extrusion.

For hardening, in a preferred embodiment, from 0.8 to 5% by weight, preferably from 1 to 3% by weight, of caramel and, in addition, from 0.5 to 10% by weight, preferably from 1 to 5% by weight, of a dicarboxylic acid, such as oxalic acid, malonic acid or succinic acid, are mixed in.

For edible sausage casings it is expedient to add from 1 to 10% by weight, preferably from 2 to 6% by weight (based on total weight of all components) of a dialdehyde, such as glyoxal or glutardialdehyde, a diisocyanate, such as hexamethylene diisocyanate, a diketene, a diepoxide, a lactam or lactone (e.g. δ -gluconolactone). The mixture is melted and uniformly mixed by relatively long kneading at from 90 to 170°C, preferably at from 95 to 150°C. The melt can then either be immediately extruded or granulated for later processing.

The edible seamless tubes in a caliber range from 16 to 50, preferably from 18 to 30, are expediently produced by extruding through a ring die, followed by blowing. The area stretching ratio during blowing is generally from 1:5 to 1:20, preferably from 1:6 to 1:10, particularly preferably about 1:8.

The tubes can then, in a subsequent process step, be treated internally or internally and externally and thus further modified in their properties. In particular, post-hardening can be carried out here, either using ionizing radiation, e.g. with X-rays, or with the abovementioned hardeners and crosslinkers. These can then be applied in the form of solutions or dispersions. The tubes are then (as usual) dried in the inflated state between two pairs of squeeze rolls. This is followed by a generally known manufacturing step. Generally, the tubes are gathered in sections and the resultant shirred sticks are processed on conventional machines. The seamless tubular films are particularly suitable as sausage casings, in particular for small sausages. In

addition, the shaped bodies of the invention are also suitable for packaging other foods, e.g. cheese.

5 The broad base of natural starting polymers, additives and crosslinkers in addition makes possible a very broad variation of the properties expected of food casings, so that shaped bodies may be adapted precisely to highly specific requirements, as shown by the following examples. Percentages are percentages by weight, unless
10 stated otherwise.

Example 1

a) Preparation of thermoplastic starch:
15 100 kg of potato starch were dried under reduced pressure to a water content of less than 0.3% and melted and well mixed with 50 kg of glycerol (99% pure) in a kneader at from 160 to 190°C; to abolish the helix structure of the starch, the melt was kept
20 for 2 h at 170°C; the mass was then extruded and granulated. On subsequent storage of the granules, the starch remained in the amorphous state.

b) Blending and production of a film:
25 50 kg of the granules under a) (33.3 kg of starch + 16.7 kg of glycerol) were admixed with:
25 kg of extrudable gelatin,
10 kg of woodpulp fibers,
30 2 kg of sorbitol,
4 kg of malonic acid,
8 kg of sunflower seed oil and
1 kg of caramel

35 The mixture was melted at 160°C in an extruder, uniformly dispersed and extruded through a 40 cm flat-film die, stretched (stretching ratio in the machine direction 1:4, in the transverse direction 1:10), cooled, conditioned to 8% moisture content and wound up. The properties of the

film produced in this manner are given in the table below:

5	Weight	Thick- ness	Ultimate tensile strength (dry) N/mm ²		Elongation at break in %		Swell- ing value
	gm ²	µm	longi- tudinal	trans- verse	longi- tudinal	trans- verse	%
	42	35	28	18	15	22	180

Meat products, in particular cooked ham, were wrapped with this film and covered with a net. After cooking, the net could be removed without problems. The cooked ham was then sliced together with the film casing. The film was oxygen- and smoke-permeable, but had low liquid- and fat-permeability.

15 Example 2

40 kg of partially acetylated starch having a degree of substitution of 2.2,
 25 kg of extrudable gelatin,
 20 5 kg of chitosan,
 20 kg of glycerol,
 3 kg of caramel,
 2 kg of hexamethylene diisocyanate and
 5 kg of sunflower seed oil

25 were thoroughly mixed. The mixture was melted at a temperature from 170 to 180°C, then kept at 175°C for 30 min and then extruded as a film through an 80 cm flat-film die, stretched, longitudinally 1:6, transversely 1:8),
 30 heat-set, conditioned (to a moisture content of 10%) and wound up. The properties of the film produced in this manner are given in the table below:

Weight	Thick- ness	Ultimate tensile strength (dry) N/mm ²		Elongation at break in %		Swell- ing value
gm ²	µm	longi- tudinal	trans- verse	longi- tudinal	trans- verse	%
48	40	35	24	12	26	168

5

The film is suitable for warpping the most varied types of meat products and can be consumed with them.

Example 3

10

a) Preparation of thermoplastic starch:

15

75 kg of potato starch were dried under reduced pressure to a water content of less than 0.3%, 25 kg of glycerol (99% pure) were added and the mixture was melted and mixed thoroughly in a twin-screw kneader at from 160 to 190°C. The melt was then kept at 175°C for 2 h, extruded and granulated.

b) Blending and production of a tube:

20

51 kg of the granules under a) were admixed with:

25

20 kg of extrudable gelatin,
10 kg of chitosan,
10 kg of sunflower seed oil,
5 kg of malonic acid,
2 kg of glyoxal and
2 kg of caramel.

30

This mixture was melted at 175°C in an extruder, mixed thoroughly and extruded through an annular die having a diameter of 20 mm; between the die and the first guide roll, the tube was stretched by inflation longitudinally and transversely in a ratio of 1:8 (based on the area), cooled, laid flat and wound up.

35

In the water-soaked state, the tube had a bursting

pressure of 32 kPa and a static extension at 21 kPa of 23 mm. The wall thickness was 30 μm , and the weight was 40 g/m^2 . The shirred sticks were stuffed with sausage emulsion on an automated stuffing machine, scalded, smoked and packaged.

Example 4

A mixture of

10

30 kg of extrudable gelatin,
20 kg of starch granules as under 3b),
20 kg of partially acetylated starch ([®]Sconacell S),
10 kg of glycerol,
15 10 kg of sunflower seed oil,
5 kg of glyoxal and
5 kg of caramel

20

was melted. A third of this melt was then mixed in a separate extruder with woodpulp fibers of a length of from 0.5 to 1.5 mm. Using a special die having a diameter of 18 mm, a three-layer tube was then produced by coextrusion, the inner and outer layers of which tube were fiber-free, while the central layer was fibrous. The tubular casing comprised 12% of fibers, based on the total weight.

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Between die and tube roll, the tube was stretched by inflation, cooled, conditioned (10% by weight of moisture content), wound up and shirred. In the water-soaked state, the tube had a bursting pressure of 36 kPa, a static elongation at 21 kPa of 22 mm, a wall thickness of 32 μm and a weight of 38 g/m^2 .

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35 The shirred sticks were stuffed with sausage emulsion on automated stuffing machines, scalded and smoked.

Example 5

A melt was produced from

- 5 30 kg of extrudable gelatin,
 20 kg of partially acetylated starch,
 10 kg of pectin,
 20 kg of glycerol,
 10 kg of olive oil,
10 5 kg of glutaraldehyde and
 5 kg of CaCO₃

and extruded as described in Example 3 to form a tube of
caliber 20. It had the same properties as the tube
15 described in Example 3.

Example 6

- 50 kg of potato starch (not dried) were kneaded with
10 kg of water and
20 10 kg of glycerol

at from 100 to 120°C for 2 hours. A substantial part of
the water evaporated in the course of this. The resultant
mass was mixed with 10 kg of glycerol and 1 kg of glyoxal
25 and extruded at 140°C as described above through an
annular die having a diameter of 20 mm and blown (area
stretching ratio: 1:6). The properties of the film thus
produced are given in the table below:

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Weight	Thick- ness	Ultimate tensile strength (dry) N/mm ²		Elongation at break in %		Swell- ing value
gm ²	µm	longi- tudinal	trans- verse	longi- tudinal	trans- verse	%
38	40	32	24	15	20	120

Patent Claims

1. An edible shaped body in the form of a flat or tubular film based on plastifiable biopolymers or cleavage products or derivatives thereof and/or synthetic polymers of natural monomers is produced by a process having the following stages:
- a) mixing the biopolymers, cleavage products or derivatives thereof and/or the synthetic polymers with at least one edible plasticizer, at least one lubricant and at least one crosslinker,
 - b) melting the resultant mixture to give a thermoplastic mass,
 - c) extruding this mass and
 - d) calendering and/or stretching or blowing the product obtained from the extrusion to give the edible shaped body.
2. The shaped body as claimed in claim 1, wherein the plastifiable biopolymer, the likewise plastifiable cleavage products produced therefrom and/or the plastifiable synthetic polymer is thermoplastic starch, a starch derivative, an extrudable natural protein, casein or a casein derivate, chitin, chitosan, alginic acid, alginate, carrageenan, dextran, galactomannan, pectin or polylactic acid.
3. The shaped body as claimed in claim 1 or 2, wherein the content of plastifiable biopolymer, cleavage products and derivatives thereof and synthetic polymers of natural monomers is from 10 to 90% by weight, preferably from 15 to 80% by weight, in each case based on the total weight of the shaped body.
4. The shaped body as claimed in one or more of claims 1 to 3, wherein the plasticizer is glycerol, diglycerol, sorbitol, sorbitol ester, triglycol or

carboxymethylcellulose.

5. The shaped body as claimed in one of more of claims 1 to 4, wherein the content of plasticizer(s) is from 0.5 to 50% by weight, preferably from 2 to 25% by weight, in each case based on the total weight of the shaped body.
6. The shaped body as claimed in one or more of claims 1 to 5, wherein the lubricant is a vegetable oil, preference being given to sunflower seed oil, rapeseed oil, olive oil and poppyseed oil, or a lecithin, triethyl acetylcitrate, a sucrose ester, a lactone, a lactam or a synthetic triglyceride.
7. The shaped body as claimed in one or more of claims 1 to 6, wherein the content of lubricant(s) is from 2 to 30% by weight, preferably from 5 to 20% by weight, in each case based on the total weight of the shaped body.
8. The shaped body as claimed in one or more of claims 1 to 7, wherein the crosslinker is caramel, a wood smoke concentrate, a sugar aldehyde, a dialdehyde, a dicarboxylic acid, a dicarboxylic anhydride, a di- or triisocyanate, a di- or tri-epoxide or a polysaccharide aldehyde.
9. The shaped body as claimed in one or more of claims 1 to 8, wherein the content of crosslinker(s) is from 0.2 to 30% by weight, preferably from 0.5 to 25% by weight, in each case based on the total weight of the shaped body.
10. The shaped body as claimed in one or more of claims 1 to 9, wherein it comprises fibers, preferably woodpulp fibers or cotton linters.
11. The shaped body as claimed in claim 10, wherein the

woodpulp fibers have a length of from 0.2 to 5 mm, preferably from 0.5 to 2 mm.

- 5 12. The shaped body as claimed in claim 10 or 11, wherein the content of fibers is from 2 to 30% by weight, preferably from 5 to 20% by weight, in each case based on the total weight of the shaped body.
- 10 13. The shaped body as claimed in one or more of claims 1 to 12, wherein it comprises pigments.
- 15 14. The shaped body as claimed in one or more of claims 1 to 13, wherein its thickness or wall thickness is from 20 to 120 μm , preferably from 30 to 60 μm .
- 20 15. The shaped body as claimed in one or more of claims 10 to 12, wherein it includes three layers and only the central layer comprises fibers.
- 25 16. The shaped body as claimed in one or more of claims 1 to 15, wherein it is post-hardened.
17. The use of the shaped body as claimed in one or more of claims 1 to 16 for packaging foods, preferably meat or sausage products, particularly preferably as a seamless sausage casing.

DECLARATION AND POWER OF ATTORNEY

As a below-named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

EDIBLE SHAPED BODIES, IN PARTICULAR FLAT AND TUBULAR FILMS

the specification of which is attached hereto unless the following box is checked:

☒ was filed on **December 19, 1997** as ~~United States Application Number~~ or PCT International Application Number **PCT/EP97/07212** and was amended on(if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is known by me to be material to patentability as defined in Title 37, Code of Federal Regulations § 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 (a)-(d) or § 365 (b) of any foreign application(s) for patent or inventor's certificate, or § 365 (a) of any PCT International Application which designated at least one country other than the United States, listed below and have also identified below any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed:

PRIOR FOREIGN APPLICATION(S)

NUMBER	COUNTRY	DAY/MONTH/YEAR FILED	PRIORITY CLAIMED
197 04 737.8	Federal Republic of Germany	07/February/1997	YES

I hereby claim the benefit under Title 35, United States Code §119 (e) of any United States provisional application(s) listed below:

APPLICATION NUMBER	FILING DATE

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s), or § 365 (c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is known by me to be material to patentability as defined in Title 37, Code of Federal Regulations § 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application:

APPLICATION SERIAL NO.	FILING DATE	STATUS: PATENTED, PENDING, ABANDONED

I hereby appoint as my attorneys, with full powers of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith: Stephen A. Bent, Reg. No. 29,768; David A. Blumenthal, Reg. No. 26,257; William T. Ellis, Reg. No. 26,874; John J. Feldhaus, Reg. No. 28,822; Patricia D. Granados, Reg. No. 25,735; John P. Isacson, Reg. No. 33,715; Michael D. Kaminski, Reg. No. 32,904; Kenneth E. Krosin, Reg. No. 25,735; Glenn Law, Reg. No. 34,371; Eugene M. Lee, Reg. No. 32,039; Richard Linn, Reg. No. 25,144; Peter G. Mack, Reg. No. 26,001; Brian J. McNamara, Reg. No. 32,789; Sybil Meloy, Reg. No. 22,749; Richard C. Peet, Reg. No. 35,792; George E. Quillin, Reg. No. 32,792; Colin G. Sandercock, Reg. No. 31,298; Bernhard D. Saxe, Reg. No. 28,665; Charles F. Schill, Reg. No. 27,590; Richard L. Schwaab, Reg. No. 25,479; Arthur Schwartz, Reg. No. 22,115; Harold C. Wegner, Reg. No. 25,258.

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